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THE DURHAM CATHEDRAL DOORS

by C. Caple

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I. Curry, J. Darrah, R. Housley, J. Larsen and A. Millard

Introduction

The cathedral church of Durham is recognised as one of the most important survivals of Romanesque architecture in North West Europe (Pevsner 1953). This significance was emphasised through its designation in November 1986 as part of a World Heritage Site (English Heritage 1997). It had been traditionally accepted (Geddes 1980, 1982) that the north and south (monk's) doors of the Cathedral were contemporary with the fitting out of the Cathedral upon its completion in 1133.

The evidence of dating for the doors was derived principally from:

- i) That there was no trace of an earlier door
- ii) The south (monk's) door is adorned with intricately wrought iron strapwork which has been seen as a fine example of Romanesque ironwork, Figure 1,(Geddes 1980).
- iii) The north door was surmounted with the bronze sanctuary door knocker which has been assessed as 'one of the most striking achievement's of Romanesque bronze casting' (Geddes 1982, 125), (Zarnecki 1984). When the knocker was removed in the late 1970's for replication, it was noted that there was no evidence of earlier attachment, suggesting that it was still affixed in its original position on an original door.
- iv) The doors were constructed of substantial oak planks, large oaks became rare in England by the 16th century, and thus substantial timber implies a substantial tree with a commensurately early date.
- v) The construction of the door was of a type which have been suggested as dating to the late 12th century (Hewett 1982). This form of construction was certainly not of the type commonly seen in later medieval and post medieval timber construction.

This evidence, whilst circumstantial, does suggest an early 12th century date for both doors.

However, Durham Cathedral has had a eventful historical past. Following the creation of the Norman Romanesque cathedral of 1093-1133 there were further substantial phases of building of the cathedral with the late 12th century construction of the Galilee Chapel by Bishop Hugh le Puiset. The rebuilding of the east end of the church as the Chapel of the Nine Altars was completed by Bishop Bek in the 1280's, whilst in the 14th century there were the several additions to the cathedral's fabric by Bishop Hatfield. The Reformation brought considerable removal of decorative material from the church, whilst the Civil War led to invasion by the Scots who in 1640 destroyed the cathedral's font and its cover (Roberts 1994). Much damage was also believed to have been caused in 1650/1 when Cromwell kept 3000 Scottish prisoners in the cathedral over the winter. Many of the wooden fixtures and fittings are believed to have been lost to the fires of the Scottish prisoners, and to the enthusiastic restoration of the church by Bishop Cosin following the Restoration (Roberts 1994). Several notable wooden fixtures such as the font cover (1663) and the choir stalls (1665) were added at this period. The 18th and 19th centuries have seen a succession of cathedral architects who have undertaken a variety of repair and restoration projects including John Wooler who removed the outer two to four inches of the stonework of much of the cathedral due to its weathered appearance (Roberts 1994).

These events, whilst they do not specifically show that the north and south doors were ever replaced, repaired or rebuilt, do raise doubts that doors of the 12th century would have survived intact to the present day.

In the 19th century, to improve the ventilation of the church, both leaves or wings of the north door were altered, with a substantial quarter circle section cut out of the upper part of each door and fitted with vertical slatted louvres, Figure 2. In 1991 as the 900th anniversary celebrations for the founding of Durham Cathedral approached, the cathedral authorities felt that it was desirable to correct some of this 19th century work by filling in the louvred quarter circles thus returning the north door to its original appearance. In addition it was decided that it would be desirable to restore the ability to throw open the north doors of the cathedral in order that ecclesiastic processions and the congregation could proceed through the full width of the doorway. This activity had been severely restricted through the construction of internal porches in the 1950s and again in the 1980s which, whilst it improved the insulation and silence of the cathedral, had to be dismantled every time it was required to open the north doors for the purposes of processing. By extending the 19th century alteration to complete the cut across the doors, it would become possible to move the lower two thirds of the door, which, when accompanied with heightening of the internal porch would allow the regular use of the full width of the north doorway. The upper third of the doors were to be fixed permanently in position forming a tympanum in the arch of the north doorway.

These alterations to the north doors provided the opportunity to: examine the doors in greater detail, obtain some direct dating evidence for the doors and answer a question posed by the cathedral authorities as to whether the door should be repainted as part of the 900th anniversary facelift.

The Doors

The north and south doors of Durham Cathedral have the form of two leaves or wings both composed of wooden planks. Plank doors are known from Iron Age sites such as Glastonbury Lake Village (Crossley 1951) and continue to the present day. In its simplest and most common form a plank door consists of a series of vertical planks attached, usually through nailing, to a number of horizontal timbers or 'ledges' fixed crosswise behind them. Cross bracing, usually of diagonal form, is often added, especially on large doors, for additional strength and rigidity. The ledges and cross bracing can add considerably to the thickness and weight of the door (Crossley 1951).

The leaves of the north door of Durham Cathedral are composed of a series of substantial planks which have grooves or mortices cut into their sides, into which are slotted free tongues or tenons, separate long thin strips of wood, which run the length of the plank, Figure 3. The leaf of each door is composed of 4 or 5 planks, with 3 or 4 free tongues or tenons. Three thin tapering horizontal ledges are present on the back of the door to hold the vertical planks together. The ledges are roughly semi circular in cross section and are attached to the planks having been slid into shallow dove-tailed grooves which have been cut across the full width of the back of each door plank. Thus the 'wedged ledges' hold the door planks firmly in position without any need for nails. The door with its ledges partially cut into the vertical planking is both thinner and lighter than other medieval doors. The use of the countersunk 'wedged ledges' is paralleled by Hewett (1980, 1982) in the doors of Eastwood, Heybridge and possibly Elmstead churches in Essex all of which are believed to date from the later half of the 12th century. Hewett's drawn description of the Durham cathedral doors (Hewett 1985) which indicates tongued planking is incorrect and should be modified to the free tenon format, Figure 3. Hewett (1980, 1985) gives no other examples of doors made with free tenons running the length of the planks, though short free tenons are used to join planks edge to edge on doors such as those of Kempley Church which are dated to circa AD 1100. The south door of

Durham Cathedral is made in exactly the same manner as the north door, though with smaller planks.

The Eastwood, Kempley and Durham doors, together with an innovative shallow curved ledge cut into the back of the main door planking of the early Norman door of Westminster Abbey (Hewett 1980, Geddes pers. comm.), suggest that although few doors survive from this period there are a variety of novel forms of thin rigid door construction created in the 11th and 12th century period. Almost all doors from the later medieval and post medieval period have V edge notched planks and substantial horizontal ledges or cross bracing nailed into place (Hewett 1980, Crossley 1951). The slim yet rigid construction of the north and south doors of Durham Cathedral, held together through jointed construction without the use of nails or bolts and decorative iron strapwork, represent one of the highest achievements of medieval carpentry.

On the front of the north door, smaller raised vertical mouldings of wood were added to cover the long vertical jointing between the planks (Figure 2). This would have had the effect of making the door more waterproof. A similar raised moulding, of slightly wider form, was added to frame the outer edge of the door. These vertical and edge framing mouldings are a common decorative and functional device of the late medieval period, often added to earlier doors as is the case for the north doors of Wells Cathedral (Hewett 1985). In the case of the west leaf of the north door the raised exterior moulding which initially cover the plank joints, maintains a constant spacing, even when the planks become wider nearer the hinge. Thus the decorative function outweighed the functional weatherproofing role of these additions. The south (monk's) door is covered with iron strapwork, nailed onto the door which Geddes suggests on the basis of the swaged profiles for the strapwork, the design and decoration of the scrolls and the decorative form of the hinges was probably of late 12th century date and the work of Bishop le Puiset (Geddes 1982). This may have replaced thinner, plainer earlier 12th century strapwork (Geddes per comm.). This strapwork undoubtedly improved the rigidity of the door. The presence of occasional iron nailshanks in the north door and traces of raised patterns in the doors surface (Figures 4 and 5) indicates that it too originally was covered in iron strapwork and that this was subsequently removed and the vertical raised moulding was attached. Three short pieces of thin iron bar are present beneath the raised edge moulding on the west side of the west leaf of the north door and may be remains of the original strapwork or derive from later strengthening of the door. The observation that the nailshanks and raised ridges were concentrated in the outer margins with little evidence of them in the centre of the door suggests that the iron strapwork only formed a decorative outer zone on the north doors. On the south (monk's) door and other surviving examples of decorative iron strapwork the hinge itself is always an integral part of such designs on the front/exterior of the door. Thus the hinges, described as 'cranked band and gudgeon hinges' (Emery pers. comm.) are primarily affixed to the front of the door and are bent through 90° in order that the hinge loop is at the back of the door so that the door can hinge properly. The present hinges on the north door are at the back of the door and thus can not have been part of any decorative strapwork scheme.

There have, in addition to the vertical moulding to the north door, been a number of additions and alterations to these doors as attested by the presence of 13 horizontal supports currently across the back of the west leaf of the north door.

The central planks of the north door which form the edges of leaves are different to the other planks in the door since:

- i) they are bowed and distorted
- ii) they have a horizontal cut across the plank near the top of the door. The upper and lower parts of the plank appearing very different
- iii) there are nails attaching these planks to two of the three ledges, this is unnecessary in the original construction

These features indicate that these two planks have at one time or another been wrenched off the door. This resulted in the splitting, loss and damage to the edges of the adjoining plank which is now visible and has partially exposed the free tenon between the planks. At a later date these central planks, or replacements, were reattached to the door. The present planks are bowed, unlike any other planks in the door and thus may be replacements, less well seasoned than the originals. The upper portions of these planks above the horizontal cut appear intact original planks, only the lower parts were damaged and possibly replaced.

The most likely period for such extensive damage to these planks is the 17th century and the Civil War disturbance. It is possible that the doors were repaired as part of the work of Bishop Cosin and that features such as the raised moulding were added at this date. Billings (1843) suggests that the decorative strapwork remained on the north doors 'until the latest repairs' though he does not say when these occurred, and since both he and Butler in 1808 both illustrate the north door with the vertical mouldings and no strapwork it clearly refers to a much earlier period. The strapwork may have been removed as early as The Reformation as part of the general suppression of ecclesiastic ornament. It could be have removed as late as the 1780's when Nicholson removed the North Porch and remodelled the north doorway (Geddes 1982, Carne 1996).

There are two iron cramps on the back of each leaf of the north door whose purpose is clearly to hold the existing planks in tension probably due to the loosening of the original ledge and plank joints. These cramps were applied after the outer door plank was repaired or replaced and thus may be an integral part of the repairs at that period, or come from a later period of repair.

A small wicket door known as 'the eye of the needle' has been cut into the east leaf of the north door, Figure 2. It is framed and edged by the raised moulding and has two vertical raised mouldings dividing the door surface. As this moulding appears to be the same as that used on the rest of the door it appears likely that the wicket door was created at the same time as the moulding was applied, though it has been subsequently altered with the sill being lowered to permit easier access in both the 19th and 20th centuries (Curry pers. comm.).

Though little has happened to the south (monk's) doors, at some point before the 19th century the west leaf of the door was cut completely in half and additional hinges added to the lower and upper halves in order to create a smaller convenient door to permit access between the nave of the cathedral and the cloister.

Dendrochronology

Initial North Door Sequence

The carpentry work undertaken on the upper sections of the north door allowed us the opportunity to have the sections through the planks at either end of each leaf of the door planed, polished and photographed. This brought the cross section through the growth rings of the wood into perfect view. Photographs of the cross section of every plank were sent to Prof. Mike Baillie of the Dendrochronology Lab of Queens University Belfast. The technique of dendrochronology is familiar to most archaeologists and historians and is described in detail elsewhere (Baillie 1982). The initial results indicated that all four planks Q8438-Q8441 from the north door were probably from the same tree, Q8439 and Q8440 definitely so. It was observed that all traces of sapwood had been removed from the planks, only the more sturdy heartwood having been used. This was normal procedure with high quality constructional timber of the medieval period, however, this truncation of the ring patterns meant that it would be impossible to obtain an exact felling date for the trees from which the planks were cut.

Unfortunately although the photographed sections were generally good, some narrow rings were difficult to resolve, resulting in two points of doubt in the overall 160 year north door chronology. No definitive match could be found for the chronology, the best fit against a suite of British and European oak chronologies being $t = 5.3$ with a sequence from Gdansk in Poland and $t = 4.14$ from Gottingen in Germany, at an end date of AD 1664. If the timbers were indeed from this eastern region, then a sapwood allowance in the range 5-40 rings could be used, suggesting felling in the range AD 1669-1704. Such a date was not impossible, since there was an active wood trade between the Baltic and the east coast of England in the 15th to 18th centuries. However, the large number of comparisons performed inevitably reduced the significance of the correlations so that the dendrochronologists were very cautious about the result and indicated that more samples were desirable. This suggested date and provenance for the wood of the north door raised profound concerns regarding the history and dating of the bronze knocker on the north door and by implication the iron strapwork on the south door. Therefore a further series of dendrochronological dates and radiocarbon dates were sought to resolve these concerns.

South (Monks) Door Sequence

Since in the late or post medieval period a small door had been formed by cutting across the base of the west leaf of the south (monks) door, a second series of cross sections through the planks of the cathedral's main doors was available. The top of this door was planed, polished and photographed in a similar manner to the north door, though this work was done 'in situ' since the door could not easily be removed, Figure 3. The photographs were again analysed at the Belfast dendrochronology laboratory. The growth ring data revealed:

- i) Four usable ring patterns, Q8794-Q8797, which were found to cross-date with each other and with the four patterns from the north door. This clarified the problems with the original samples and extended the Durham chronology from 160 to 192 years.
- ii) All four planks from the south door were quite possibly from the same tree, while one Q8797, was almost certainly from the same tree as Q8441 from the north door. The overall similarity between the ring patterns makes it likely that all eight planks could have derived from a single substantial oak tree. It, therefore, appears likely that all 17 planks, some nearly 6m in height, used in the construction of the north and south doors were derived from a single, tall, straight and very substantial oak tree. However, further detailed examination of the original sections would be needed to prove this point.
- iii) The revised and extended Durham Cathedral door chronology cross-dated definitively with two medieval oak chronologies, giving $t = 6.46$ against Carlisle and $t = 5.05$ against East Midlands, at an end date of AD 1094. The revised chronology gave no significant correlation against Gdansk/Gottingen chronologies and the tentative later date can safely be ignored.
- iv) Hillam et al (1987) have suggested an allowance for sapwood on English oaks of 15-50 rings with 95% confidence. Applying this to the Durham Cathedral door chronology suggests a felling date in the range AD 1109 - 1144, or possibly later if some heartwood rings are also missing.

Radiocarbon

It was desirable to remove as little material as possible from the doors on which to undertake radiocarbon dating. Thus small samples of solid oak wood were obtained using a high speed router which removed samples approximately 9mm in diameter and 17mm in length from the cross sections of the exposed planks, Figure 3. Samples were obtained from two locations on plank 2 of the west leaf of the south (monk's) door which had been exposed and cleaned for dendrochronology. Two samples were also to be obtained from plank 4 of the east leaf of the north door. The upper sections of the door

which had been photographed when under repair in the Cathedral's carpentry workshop for the dendrochronology work were now permanently affixed in the top of the north doorway of the cathedral and no longer available for sampling. Thus to obtain the relevant samples a scaffolding tower was erected to permit the drilling down into a clean cross section of the planks of the main body of the north door.

The samples were submitted to the Oxford Radiocarbon Accelerator laboratory with whom an allocation of 4 dates for this project had been secured. The accelerator was used so that only small samples needed to be taken to avoid damaging the doors. The standard procedures for radiocarbon dating using an accelerator, detailed by Hedges et al (1989), were followed and dates subsequently published in the Archaeometry Datelist 20 (Hedges et al 1995).

South Door, West Leaf, Plank 2, Sample S1 (OxA-4098) 1190 +/- 70 years BP
South Door, West Leaf, Plank 2, Sample S2 (OxA-4199) 1070 +/- 65 years BP
North Door, East Leaf, Plank 4, Sample N1 (OxA-4100) 900 +/- 70 years BP
North Door, East Leaf, Plank 4, Sample N2 (OxA-4101) 1205 +/- 70 years BP

Dating

The radiocarbon samples S1 and S2 from the South (Monks) Door Plank 2 (Q8795) with dates of 1190+/-70 BP and 1070+/-65 BP have 72 rings between their mid points. Calibrating using the program OxCal 2.18 (Bronk Ramsey 1995), with calculations performed at an internal resolution of 1 year using the decadal calibration of Stuiver & Kra (1986) and a known difference of 72 years between the two dates, gives a calendar age for S1, at 95% confidence, as AD 756-960. The mid ring of S1 is at least 113 rings (possibly up to 123) from the outermost ring on the plank, giving a best estimate for the outer ring of AD 869-1073 (or slightly later). This is entirely consistent with the dendrochronological date from the Queens University laboratory of AD 1045 for the outermost ring of South Door Plank 2.

Radiocarbon samples N1 and N2 (Q8440) from the north door, with dates 900+/-70 BP and 1205+/-70 BP calibrate respectively to AD 1016-1256 and AD 675-964 at the 95% confidence level. These dates are entirely consistent with and support the dendrochronological date for the North Door which is AD 935 - 1094. The slight separation of the radiocarbon sampling points and location from which the dendrochronological data was obtained means that although taken from the same plank, they cannot be more closely correlated.

The dendrochronology and radiocarbon dating unequivocally indicates that both the north and south doors of Durham Cathedral are of 12th century construction. The best estimated fell date for the tree from which they were made, allowing 15 - 50 years for the sapwood growth, is AD 1109-1144. This single giant oak tree, felled in the early 12th century, was probably split to form planks and seasoned before it was assembled into a door and installed in the Cathedral during the final phases of the construction of the nave which occurred between 1128 and 1133. This dating strengthens the suggestion that the strapwork on the south door and the sanctuary knocker of the north door are original Romanesque pieces of metalwork.

Paint

The north door is currently a greying black colour, whilst the south (monks) door is a greying black colour with red strapwork. As part of the investigation of the door, samples of the paint from the upper portions of the front of the north door were removed for cross sectional analysis. Samples of the wood were also removed for identification.

The wood of the door was identified as *Quercus* sp. (oak). The only vertical moulding which was sampled identified as *Pinus* sp. (pine). Oak was the major wood used for

constructional purposes such as doors, floors, roofs etc. in the medieval period and thus is the wood to be expected for constructional use of the main cathedral doors. The use of pine for the beading is perhaps less expected. Pine was rarely used in the early and high middle ages, since it was scarce in England. By the late middle ages timber was imported from Scandinavia, the Baltic and upland Britain and thus woods such as pine imported from these areas became more commonly used. Pine planking starts appearing in London in the 15th and 16th centuries.

The four sections through the paint were obtained and analysed by Jo Darrah of the Victoria and Albert Museum. Three sections were painted from on top of the oak planks of the door, one sample was from the pine moulding. The full range of paint layers were seen in the sections above the oak and above the pine, thus the door was painted after the pine moulding was added. The surface of the oak wood appeared dark and old, possibly even stained, and appeared to be of some antiquity (Darrah pers. comm.) a fact later confirmed by the dendrochronology and radiocarbon dating. The pine and the paint layers generally appear fresher in cross section and thus may be younger than the oak (Darrah pers. comm.).

A series of layers are identifiable in the paint, most though not all were distinguishable in every section, Figure 6:

- 6) Wax or Varnish
- 5) Black Brown paint
- 4) Brown paint
- 3) Brown paint (red ochre and carbon black particles are identifiable)
- 2b) Thin brown
- 2a) White (probably white lead)
- 1) black
- Wood substrate (oak / pine)

The wax/varnish coat is extremely degraded, milky with age, its loss of transparency is leading to the greying appearance of the door at present. The brown layers have coalesced and there may be several thinner layers within these thick layers. A large number of coatings and paint formulations have been used to cover exterior wood and metal work in the past. In the 19th century exterior paints containing road dust and bitumen were used (Darrah pers. comm.). The colour of the north door in recent decades has clearly been black or dark brown. It could be suggested that the mixtures of black and red ochre colours to achieve dark red and brown colours were an attempt to simulate a darkened oak colouration. Such colouring schemes would suggest a late 18th or 19th century date for this phase of the paintwork (Larson pers. comm.). The white and thin brown paint layers may indicate that at some point in the past the door was painted in a mock wood scheme, white background with variable brown streaking or perhaps a red and white pattern design. Whilst modern painting regimes usually repaint every 7-10 years, the repainting regimes of the past may have been far less frequent, particularly given the traditional parsimony of the church towards its estate. However, the small number of paint layers does not suggest a painted scheme of any great antiquity, nor does the condition of the paint (Darrah pers. comm.). The present paint layers are almost certainly post medieval and are most probably the paint coatings of the 18th, 19th and 20th centuries. If the door were, as was previously suggested, repaired in the 17th century as part of the work of Bishop Cosin, then this appears to be the earliest date at which the vertical pine mouldings and first layers of paint could have been applied.

Conservation

Given the age of the door, and thus far this is the only church or cathedral door, of which we are aware, that has been definitively dated by radiocarbon or dendrochronological dating, it appeared prudent to the Cathedral's fabric committee, who had responsibility

to advise on this project, that the paint on the north door should not be stripped off, but that a more subtle approach should be used. The initial tests suggested that little or nothing could adhere to the degraded wax which covered the present door surface, therefore, the initial work focused on removing this degraded, 20th century, outer coating. Initial attempts were made to find a solvent to dissolve the outer wax coat with a range of solvents: Industrial Methylated Spirits, Trichloroethane, Acetone, White Spirit, Toluene, had no effect, whilst a powerful dichloromethane based solvent such as 'Nitromors' removed the paint layer beneath as well as the wax layer. Thus solvents were not the answer. Eventually it was found that the flaking wax layer had become brittle with age and could be removed with an air abrasive operating at low pressure (Clogg pers. comm.). The door was subsequently cleaned of its wax layer by conservators using air abrasive systems (Hanna 1996). The cleaned surface of the door is now being monitored to see if it remains in a stable condition or whether a reversible protective polymer coating needs to be applied.

Conclusion

The accurate dating of the north and south doors of Durham Cathedral has provided an important reference point for the study of medieval carpentry techniques, medieval ironwork and exterior paintwork. It re-enforces the view that Durham Cathedral represents a remarkably complete and important survival of a major 12th century building (Jarret & Mason 1995) and has emphasised the care needed in the conservation of all aspects of the building's fabric.

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Durham Cathedral Door: Figures

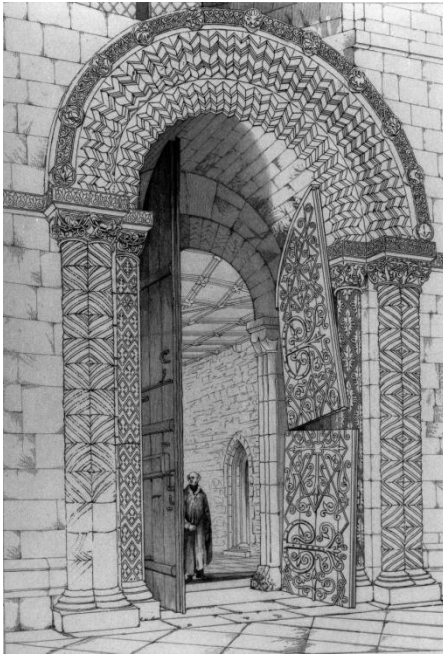


Figure 1: South (Monk's) Door: *Engraving from Billings 1843*

Note the curve backed 'wedged ledges' on the back of the door, though details of the jointing to the vertical planks are not accurately drawn

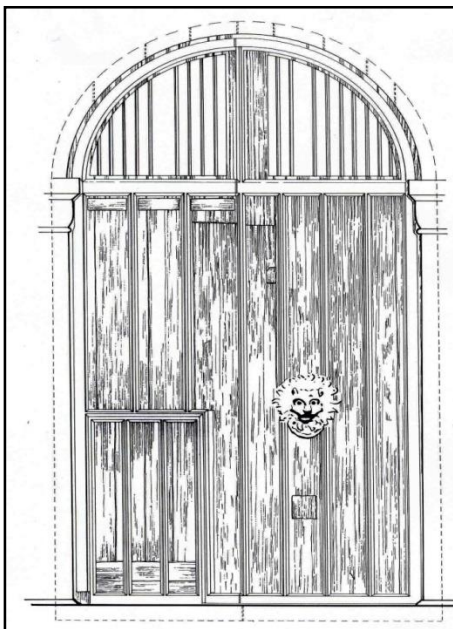


Figure 2: North Door, 1900 - 1990 AD: *Drawing by the Cathedral Architect, courtesy of the Dean and Chapter of Durham Cathedral*

Note the tympanum having the vertical louvred form created in the 19th century which obscured the original vertical planked form and the various repairs to the planking of the door. The vertical and horizontal cross sections refer only to the remaining evidence of the original door construction



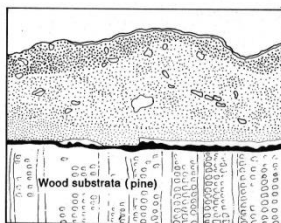
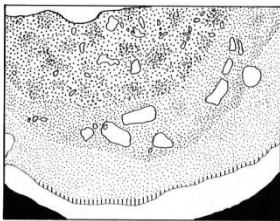
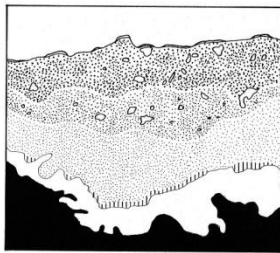
Figure 3: Cross Section Through Plank 2 (Q8795), West Leaf of the South (Monk's) Door: Photograph by Trevor Woods, Department of Archaeology, University of Durham
Note the free tenons between the mortised planks and the circular holes resulting from the removal of the samples for radiocarbon dating.



Figure 4: Upper front face of the West Leaf of the North Door during restoration.
Photographed in raking light by Trevor Woods, Department of Archaeology, University of Durham. Note the corroded nailshanks and raised ridges of the original strapwork



Figure 5: Upper front face of the East Leaf of the North Door during restoration.
Photographed in raking light by Trevor Woods, Department of Archaeology, University of Durham. Note the corroded nailshanks and raised ridges of the original strapwork










-  Black
-  White (probably white lead)
-  Thin brown
-  Brown paint (red ochre and carbon black particles are identifiable)
-  Brown paint
-  Black brown paint
-  Wax or varnish

Figure 6: Three Cross Sections Through the Paint Layers of the North Door: *Drawn by Yvonne Beadnell, Department of Archaeology, University of Durham, from photographs provided by Jo Darrah, Victoria and Albert Museum*